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teeth on the roof of the mouth, as Kner describes. There are no spines with the crania, although separate *Pleuracanthus* spines are not rare in the same beds. The teeth associated with the skulls, moreover, present a button on the superior side of the root. Agassiz figures teeth of this kind as belonging to the *Diplodus gibbosus*. St. John and Worthen make these teeth typical of *Diplodus*, and confer the name *Thrinacodus* on those without the button. The button is, however, probably only a specific character. The latter name is, then, probably a synonyme of *Pleuracanthus*. The button-bearing teeth are figured and described by Kner as occurring scattered, and at a somewhat different horizon from that of the *Pleuracanthus* specimens. In Germany, as in Texas, the button-bearing teeth are the larger. I suspect that the skulls I describe represent a different genus from *Pleuracanthus* proper. This genus will not differ from *Chlamydoselachus* Garm., so far as we know the latter; but the button indicates another species.

5. Of course, a study of the anatomy of *Chlamydoselachus*, which I hope Mr. Garman may soon give us, may reveal differences between that genus and *Didymodus*; but of these we know nothing as yet.

6. The order *Xenacanthini* was proposed by Geinitz (*Dyas*) for *Pleuracanthus* on account of the supposed sutorial character of the ventral fins. This character is supposed by Kner to be sexual. In any case, this division, whatever its value, must be subordinated to the order *Ichthyotomi*, as I define it.

E. D. COPE.

THE GOVERNMENT, AND ECONOMIC ENTOMOLOGY.

A FOURTH bulletin of the entomological division of the department of agriculture has just appeared, containing four reports, either by persons not closely connected with the department, or by its *attachés* sent on special missions, together with extracts from the miscellaneous correspondence of the division. The latter is of variable and generally insignificant value, and would have better been printed in small type: it might have been further curtailed by the omission of some absolutely worthless verbiage, though we recognize that less extraneous matter appears than has been customary in the reproduction of similar correspondence in the annual reports. Of the special reports, the most valuable is that of Mr. J. B. Smith on hop and cranberry insects, of which he mentions seven or eight species as attacking each plant. The least valuable is Mr. Branner's report of his mission to Brazil in the interest of the division. Being, apparently, only a temporary document, and valuable almost entirely for departmental purposes, it was quite unnecessary to publish it: on the other hand, if this is all that is to appear, his expedition must be deemed a failure.

The issue of these bulletins — an innovation in the practice of the department — indicates a laudable intention, on the part of the commis-

sioner, to publish with promptness reports of its special agents upon particular topics. Since this cannot fail to stimulate those engaged in its work, and to enhance the value of the division in the eyes of our large agricultural population, it deserves commendation. We venture to suggest that the plan could be improved by issuing the bulletin at stated intervals, and making it a periodical, to which contributions from all quarters should be invited. All the entomologists of the country might thus become collaborators of the department without further cost to the treasury than the publication of the results of their researches: it would prove a credit to the bureau, a vast encouragement to economic entomology, and a boon to our agriculturists. The former experience of the present head of the division renders him an eminently fit person under whom to inaugurate such a plan.

In few countries in the world would such a plan be more desirable, more advantageous, or more likely to succeed. Covering, as our country does, a wide extent of fertile territory subject to most varied climatic conditions, and hence embracing unusual diversity of economic problems, our people are at the same time extremely ready to contribute their knowledge or experience, without compensation, for the public weal. Americans are not always anxious for precedents; yet, if precedent is demanded, the *Annales de la science agronomique* (just published under the auspices of the minister of agriculture), the various reviews, such as the *Revue des sociétés savantes* and the *Bibliothèque de l'école des hautes études* (long published by the minister of public instruction), together with the *Revue maritime et coloniale* (issued under the direction of the minister of marine), show what France alone has done, in similar ways, for science and industry during the past twenty-five years. It is time our government supported similar aids to material and intellectual growth.

In harmony with this plan, a further extension of the work of the division would prove desirable. Why would it not be feasible to district the country (omitting the sterile portions) into, say, half a dozen great areas, based on the geographical distribution of the main agricultural products and on climatological factors, and permanently locate, at some convenient centre in each, skillful assistants of the division to study *on the spot* the history and devastations of noxious insects? It is as impossible to do this work at Washington as to do that of the coast-survey or the geological survey, each of which has permanent establish-

ments in various parts of the country. A skilled entomologist at such a centre, with one trained assistant whom he might despatch to study local problems not far distant, would accomplish more than twice that number could on the border of the continent, whence the assistant must often travel many thousand miles to reach a field requiring investigation, and be able to remain there only a brief period. The state entomologists are not numerous enough to affect the question in the least. Illinois and New York alone support officers who are doing a really creditable work; and these great states, rich, populous, and fertile, would be insufficiently served, under this scheme, without the aid of their own officials.

This would require a doubled, perhaps a trebled, appropriation for the division. What of that? Its work should be measured, not by what it has been able to do with insufficient means, but by its inherent importance to the largest and most wide-spread industry in the country. A trebled allowance, multiplied a thousand-fold, would not equal the losses yearly sustained by agriculture, reasonably to be classed as avoidable by means which the study of their causes will reveal. The work of the division for the past six years has been admirable, as far as it has gone: it has gained the approval of those who know what scientific work is, and the appreciation of the great class who have seen its practical benefits. It is time to ask, and to grant, the means for a forward step.

RECENT GEOLOGICAL OBSERVATIONS IN THE CANADIAN NORTH-WEST TERRITORY.¹

IN a former number of *Science* (i. p. 477) a note was given on some points relating to the glaciation of that part of the North-West Territory which occupies the angle between the eastern base of the Rocky Mountains and the 49th parallel. During the summer of 1883 the examinations necessary for the production of a proximately exact geological map, covering an area of over twenty thousand square miles in this district, have been completed, and the mapping of the contiguous area to the eastward has been begun. A number of new facts of geological interest have been brought to light during the prosecution of the work, a few of the more important of which it is proposed here briefly to mention.

In the article above alluded to, the great

elevation at which Laurentian and Huronian erratics occur near the mountains was specially noted; and some of the greatest heights up to that time observed were stated as 4,200, 4,390, 4,660 feet, respectively, above the sea-level. In August last, however, several indubitable Laurentian boulders, representing different characteristic varieties of gneissic and granitic rocks, were found at an elevation of 5,280 feet, at a point in the foot-hills about twenty miles north of the 49th parallel. The ridge upon which these occur lies within a few miles of the paleozoic rocks of the mountains, and, like many others in this vicinity, is evidently a slightly modified moraine, due to the local glaciers of the mountains. The boulders are associated with many blocks derived from the neighboring mountains. They cannot, however, have come from the Rocky Mountains, as a tolerably complete examination of the range, between the 49th and 51st parallels, has confirmed the statement, previously made in a more general way, as to the absence of crystalline rocks in the constitution of the range: their origin must therefore be sought, with that of the immense profusion of similar erratics strewn over the neighboring lower country, to the east or north-east, in the great Laurentian axis.

In the Cypress Hills (latitude 49° 40', longitude 110°), which constitute an isolated, high plateau of irregular form, Mr. R. G. McConnell has noted some interesting points connected with the limit in height of the drift and boulder deposits. The western end of the hills is highest, and is flat-topped and regular in form; while the eastern and lower part has been worn down to an irregular, rounded, and rolling plateau, on which numerous Laurentian and limestone boulders, resembling those generally scattered over the plains, occur. The highest point at which these were found is 4,340 feet above sea-level; while at 4,400 feet, and other points exceeding this elevation, no such erratics occur. From the observations first referred to, it is certain that this, though locally the upward limit of the glacial deposits, is surpassed by that of other places farther to the west; and it adds to the evidence already obtained, indicating an unequal depression of the plains in glacial times.

In these hills another very interesting discovery has been made by Mr. McConnell; viz., that of the occurrence of considerable outlying areas of an upper tertiary formation of miocene age, consisting, in large part, of rolled shingle which has been derived entirely from the harder rocks of the mountains. The peb-

¹ Communicated, in advance of publication of report, by permission of the director of the Geological survey of Canada.